

NON-PUBLIC?: N  
ACCESSION #: 8908140128  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Yankee Nuclear Power Station PAGE: 1 of 3

DOCKET NUMBER: 05000029

TITLE: Reactor/Turbine Trip on Loss of Generator Field Excitation  
EVENT DATE: 05/17/88 LER #: 88-008-01 REPORT DATE: 08/04/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Russell A. Mellor, Technical Director TELEPHONE: (413)424-5261

COMPONENT FAILURE DESCRIPTION:  
CAUSE: B SYSTEM: TL COMPONENT: EXC MANUFACTURER: G080  
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

At 2323 hours, 17 May 1988, in Mode 1 at full power operation (100%), a loss of generator field excitation resulted in automatic turbine governor response and subsequent relay action which tripped BK-1 and BK-2 (reactor trip breakers). The loss of generator field excitation resulted from automatic tripping of the AC feed to the static exciter. The Harriman (Z-126) transmission line also deenergized during this event. Loss of both generator excitation and one of two transmission lines resulted in a loss of flow from three of four main coolant pumps (MCPs). The operators secured MCP #1 approximately two minutes after plant trip and established natural circulation. By 2330 hours the Z-126 line had been re-energized. By 2345 hours the electrical busses had been cross-tied and restart of the MCPs had commenced. At 0005 hours, 18 May 1988, all four MCPs were operating. All automatic safety systems functioned as designed: the plant emergency diesel generators No 2 and 3 started as required.

The root cause of this event was a failure of the Field Overvoltage Protection unit circuit board. Corrective action involves implementing a plant design change that will modify the static exciter's internal control and 2400V feeder

circuit breaker control. There was no adverse effect to the public health or safety. This is the first occurrence of this nature at this facility.

END OF ABSTRACT

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At 2323 hours, 17 May 1988, while in Mode 1 at normal full power operation (100%), a loss of generator field excitation EIIS:TL! resulted in automatic turbine governor response initiating a rapid closure of the turbine control valves EIIS:FCV!. The closure of all four control valves energized the 20TVX relay EIIS:RLY! which caused BK-1 and BK-2 (reactor trip breakers) EIIS:BKR! to trip the reactor. The 20TVX relay also trips the Cabot transmission line OCB (Y-177) and the Harriman transmission line OCB (Z-126). Independent relay action at the Harriman end of the Z-126 line opened the Harriman end of the line, de-energizing the line. As a result, bus 2, which is normally connected to the Z-126 line, de-energized. Because the AC feed from bus 1 to the exciter EIIS:EXC! had tripped, and because the logic for automatic bus cross-tie had not been satisfied, bus 1 also de-energized. The trip of the AC feed to the static exciter prevented the self-excited coastdown of the turbine generator EIIS:TG! which normally provides power continuity to main coolant pumps (MCP) 2 and 3 after a plant trip. The de-energizing of buses 1 and 2 resulted in a loss of flow from three of four MCPs at the time of the trip. MCP #1 continued to operate. The NRC was notified via the ENS at 0120 hours, 18 May 1988.

Approximately two minutes after the plant trip, the operators secured MCP #1 and established natural circulation. By 2330 hours, the Z-126 line had been re-energized. By 2345 hours, the electrical busses had been cross-tied and restart of MCPs had commenced. At 0005 hours, 18 May 1988, all four MCPs were operating. All automatic safety systems functioned as designed: the plant emergency diesel generators No. 2 & 3 started as required.

The root cause of this event was a failure of the Field Overvoltage Protection (FOP) unit circuit board. Per design, this FOP failure initiated (1) the suppression of the silicone control rectifiers (SCRs) and inherently, the nearly instantaneous collapse of the generator field current, and (2) the energization of relays 52TX and 52TR incorporated in the static exciter's control. This is supported by the fact that plant operators observed excitation voltage and current, prior to and during the transfer of exciter control from automatic to manual regulation and verified the excitation levels to be normal.

It is believed that there was a momentary fault on the Harriman high-voltage transmission line (Z-126) prior to the loss of generator field excitation. This momentary fault may have caused the FOP circuit to fail and produce

a spurious trip signal.

Corrective action involves implementing a plant design change that will modify the following static exciter (SE) controls:

. SE Internal Control - replace existing self-reset relay 52TX in the control with a latching relay with manual reset

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. SE 2400V Feeder Circuit Breaker Control - remove 56XB relay contact from trip circuit of 2400V SE breaker

These equipment modifications will prevent tripping the SE 2400V breaker on a loss of generator field excitation or on a component failure. A trip signal generated by the SE will actuate the necessary plant protective relays. This modification will be implemented prior to returning the SE to service.

An evaluation was made of the specific circumstances of simultaneous loss of flow from three MCPs and it was determined that the departure from nucleate boiling ratio (DNBR) remained greater than 1.3. This evaluation was made using design power distribution peaking factors which are more conservative than those prevailing during actual operation. No fuel cladding failures should occur with DNBR above 1.3.

As a result of this event, there was no adverse effect to the public health and safety. This is the first occurrence of this nature at this facility.

ATTACHMENT 1 TO 8908140128 PAGE 1 OF 1

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August 4, 1989  
BYR 89-115

TO: NRC - DOCUMENT CONTROL DESK  
DOCUMENT: LICENSEE EVENT REPORT, LER  
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U.S. Nuclear Regulatory Commission  
Document Control Desk,  
Washington, DC 20555

Subject: Licensee Event Report No. 50-29/88-08, Rev. No. 1

Reactor/Turbine Trip on Loss of Generator Field Excitation

Dear Sir:

In accordance with 10 CFR 50.73(a)(2)(iv), the attached revised Licensee Event Report is hereby submitted.

Very truly yours,

Timothy K. Henderson

Acting Plant Superintendent

DJK/pkg  
ENCLOSURE

cc: 3! NSARC Chairman (YAEC)  
1! Institute of Nuclear Power Operations (INPO)  
1! USNRC, Region I  
1! Resident Inspector

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